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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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ART UNIT	PAPER NUMBER
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/710,391	AVINASH ET AL.	
	Examiner	Art Unit	
	NATHAN BLOOM	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07/18/2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) *1-19,23-26,30 and 31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19,23-26,30 and 31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/18/2008 has been entered.

Response to Arguments

2. Applicant's arguments with respect to claims 1-19, 23-26, and 30-31 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 101

3. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

4. Claims 1-19 and 23-26 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. While the claims recite a series of steps or acts to be performed, a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing (Reference the May 15, 2008 memorandum issued by Deputy Commissioner for Patent Examining Policy, John J. Love, titled "Clarification of 'Processes' under 35 U.S.C. 101"). The instant claims neither transform underlying subject

matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-19, 23-26, and 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Avinash (US 6208763) in view of Gondek (US 2003/0026495).

Instant claim 1: A method of adaptively reducing noise within an x-ray image comprising:

receiving raw image data from an x-ray detector representing a detected x-ray signal from an object being imaged; [*See line 18 column 3 to line 13 column 4 and Figure 1 of Avinash.*]

generating a counts-based modulation mask based on said raw image data; [*Avinash has taught the adaptive enhancement of x-ray images based on detected structure, but has not taught the (counts are equivalent to the intensity of the pixel - as defined by specification) intensity based filtering of the x-ray image data to reduce image noise. However, Gondek has taught in paragraphs 0025 and 0043 a method of reducing image noise by selecting a filter (weight based mask) based on the amount of noise in the image (none, low, medium, and high). It would have been obvious to one of ordinary skill in the art to modify the structure based noise reduction teachings of Avinash with the variable low pass filtering of Gondek to reduce the amount of*

noise in the image while minimizing the adverse effect of the low pass filtering on perceived image quality.]

generating a structure dependent noise filtered image based on said raw image data; and [*Avinash has taught the reduction of image noise by filtering based on structure in step 66 of figure 3 and line 56 of column 4 to line 65 of column 6.*]

generating a noise reduced image based on said counts-based modulation mask and said structure dependent noise filtered image. [*See above, wherein Avinash has taught the structure based filtering, and Gondek has taught the varying of noise filtering based on the local pixel intensities (measure of noise and edge/non-edge pixel).*]

wherein generating said counts-based modulation mask is generated by a weighted value of said detected x-ray signal intensity of said raw image data at each pixel of said x-ray detector; [*Inherently, a low pass filter (as taught by Gondek) assigns a weighted value of pixel intensities to each pixel of the image.*]

wherein said weighted value is defined by a group of count modulation curves; and [*Paragraphs 0025 and 0043 of Gondek has taught the assignment of weighted values using a set of filters (intensity modulation curves).*]

wherein each count modulation curve in said group of count modulation curves effects a different level of noise reduction. [*Gondek has taught in paragraphs 0025 and 0043 the application of various low pass filters (count modulation curves) based on the amount of noise reduction (less for edge regions more for flat noisy regions).*]

Instant claim 2: A method as in claim 1 further comprising:

generating a structure gradient mask based on said raw image data; and [*Avinash in lines 56 of column 4 to line 65 of column 6 teaches the creation of the gradient image and the thresholding of it to create the structure gradient mask.*]

generating said noise reduced image based on said structure gradient mask. [*Noise reduced image is calculated from structure gradient mask through filtering of structure/non-structure regions. For further explanation of filtering steps see columns 8-12 of Avinash.*]

Instant claim 3: A method as in claim 1 further comprising:

normalizing said raw image data in response to a dose-sensitivity setting of said x-ray detector; and [*Figure 3 object 64 and lines 40-55 of column 4 (Avinash).*]

generating said noise reduced image in response to said normalization. [*As can be seen in Figure 3 this step is one of the first steps in the process of creating a reduced noise image.*]

Instant claim 4: [See the rejection of claim 1.]

Instant claim 5: A method as in claim 4 further comprising:

executing a structural analysis of said raw image data to derive a structure dependent noise filtered image; and [*See line 30 of column 5 to line 65 of column 6 wherein Avinash has taught that the structural analysis is done by creating a gradient image and thresholding this image.*]

generating said noise reduced image based on said structure dependent noise filtered image. [*Noise reduced image is end result of the process wherein the structure is identified and*

then further refined before filtering (noise reduction) is performed. See columns 8-12 (Avinash) for filtering details.]

Instant claim 6: A method as in claim 4 wherein said structure gradient mask is generated in response to execution of a structural analysis of said raw image data. [*See line 30 of column 5 to line 65 of column 6 wherein Avinash has taught that the structural analysis is done by creating a gradient image and thresholding this image.*]

Instant claim 7: A method as in claim 4 wherein generating said noise reduced image comprises:

generating a conditioned structure mask based on said raw image data; and [*See (Avinash) line 66 of column 6 to line 65 of column 8 wherein further masking is performed to analyze the connectivity of pixels and thus improve (condition/refine) the structure mask.*]

blending said counts-based modulation mask and said conditioned structure mask to generate a blended image having a plurality of blended values. [*In lines 1-19 of column 9 of Avinash the mask is refined (blended) based on the creation of new binary mask that is created based on a count of the pixel of interest. A plurality of values (0 or 1) are generated for the mask and then based on this mask the values of the mask Ms (structure intensity) are blended with the (plurality) values of alpha and beta.*]

Instant claim 8: A method as in claim 7 wherein blending comprises modulating said blending values at each pixel location of said plurality of pixels based on said counts-based modulation mask [*Binary count based masking (Avinash).*] and said conditioned structure mask [*Gradient*

Threshold Mask]. [*See rejection of instant claim 7. Furthermore, filtering based on multipliers alpha and beta, as taught by Avinash, involves changing (modulating) the values within the kernel.*]

Instant claim 9: A method as in claim 4 further comprising:

executing a structural analysis of said raw image data to derive a structure dependent noise filtered image and to generate a conditioned structure mask; [*See rejection of claims 5 and 7.*]

blending said raw image data, said counts-based modulation mask, said structure dependent noise filtered image, and said conditioned structure mask to generate a blended image [*See rejection of claim 5 wherein refinement (blending) of conditioned structure mask and count based mask is performed and rejection of claim 7 where refinement/conditioning of structured mask is performed thus creating the conditioned mask. Avinash has taught In line 64 of column 11 to line 43 of column 12 that the raw image data is blended with the masked image data.*]; and

generating said noise reduced image based on said blended image. [*End product of blending and filtering the masks and image.*]

Instant claim 10: A method as in claim 9 wherein said blended image is generated in response to a final mask defined as the multiplication of said counts-based modulation mask and said conditioned structure mask. [*Final mask is the mask that is created after the filtering based on alpha beta and the counts-based modulation mask described in the rejection of instant claim 7.*]

Instant claim 11: A method as in claim 10 wherein said blended image is generated in response to the multiplication of said structure dependent noise filtered image, said final mask, and a predetermined blend parameter. [*See Avinash column 12 lines 10-43 and Fig 15 for the blending step where in the blend parameters "1-a", 1-b" and T are used.*]

Instant claim 12: A method as in claim 10 wherein said blended image is generated in response to the multiplication of said raw image data by a subtracted result of one minus a multiplied result of a predetermined blend parameter and said final mask. [*See rejection of claim 11 wherein "a" and "b" are blend parameters.*]

Instant claim 13: A method as in claim 4 further comprising:

generating a conditioned structure mask in response to said structure gradient mask; and [*See rejection of instant claim 7.*]

generating said noise reduced image in response to said conditioned structure mask. [*End product of the masking and filtering process.*]

Instant claim 14: A method as in claim 13 wherein said conditioned structure mask is generated in response to a low count modulation of said raw data and a weighted function. [*Avinash in column 6 line 66 to column 7 line 45 discloses a connectivity analysis which removes groups of connected pixels have populations lower than a threshold (low count modulation) thus refining (conditioning) the structure mask by removing noisy segments.*]

Instant claim 15: A method as in claim 13 wherein generating said conditioned structure mask comprises:

generating a gradient threshold value; [*See column 7 line 65 to column 8 line 17 Avinash has taught using the histogram to generate the threshold.*]

generating a gradient threshold scaler; [*The threshold, as taught by Avinash, is scaled proportionally to the desired number of structure pixels (see same section as noted above).*]

generating a weighted function in response to said structure gradient mask, said gradient threshold value, and said gradient threshold scaler; and [*The weights one and zero are applied based on if the pixel values are greater/less than the threshold value (lines 27-65 of column 8 Avinash).*]

generating said conditioned structure mask in response to said raw data and said weighted function. [*As per rejection above, mask of 1's and 0's is created (column 8 lines 60-65 of Avinash).*]

Instant claim 16: A method as in claim 13 wherein said conditioned structure mask is generated in response to a low count limit and a low count flat. [*See focus parameter (low count flat, flat or constant value added in addition to desired population count of structural pixels) and the counted population (pixels counted in step 94 of Fig.4, or low count limit). See line 65 column 7 to line 17 of column 8 of Avinash, wherein the two parameters are used to generate the threshold and thus the conditioned structure mask.*]

Instant claim 17: A method as in claim 4 wherein said counts-based modulation mask represents a weighting function on absolute detected intensities comprising effects of imaging system gain. [*Pixel values are detected intensities comprised of the effects of imaging system gain and thus the mask weighting function described in the rejection of instant claim 15 depends on "absolute detect intensities……".*]

Instant claim 18: A method as in claim 4 wherein generating said noise reduced image comprises:

generating a plurality of blended values in response to said counts-based modulation mask and said structure gradient mask; and [*Values blended as per rejection of instant claim 7.*]

intensity matching said plurality of blended values. [*After values are blended (column 10 lines 45-60 of Avinash) intensity matching is performed wherein if variance exceeds a certain amount then the pixel intensity is set equal to the average value of pixels in the kernel.*]

Instant claim 19: A method as in claim 18 wherein intensity matching said plurality of blended values comprises equalizing intensity levels of said blended image. [*Intensity matching as described in rejection of instant claim 18 is the process of equalizing intensity levels.*]

Instant claim 23: A method as in claim 4 wherein said group of count modulation curves comprises a low noise reduction curve, a medium noise reduction curve, and high noise reduction curve. [*See paragraph 0043 of Gondek and the rejection of claims 1 and 4.*]

Instant claim 24: A method as in claim 4 wherein each count modulation curve comprises at least one segment selected from a primary offset segment [*Although not explicitly shown or stated by Gondek, a low pass filter inherently has a primary (DC) offset (gain) segment (portion of the frequency domain curve that describes the filter). Therefore, Gondek has taught a curve (filter) that has at least one of the listed characteristics.*], a primary roll-off segment, a secondary offset segment, a secondary offset segment, a secondary roll-off segment, primary offset segment with constant weighting, a primary roll-off segment with decreasing weighting, secondary offset segment with constant weighting, a secondary roll-off segment with decreasing weighting.

Instant claim 25: A method as in claim 4 wherein at least a portion of each count modulation curve is in a form of a Gaussian distribution. [*Gondek has not specified that the smoothing filter (removes noise) is a Gaussian filter (bell shaped filter with a Gaussian distribution. However, Examiner takes official notice that the use of Gaussian filters for noise reduction in an image was notoriously well known to one of ordinary skill in the art at the time of the invention. It would have been obvious to one of ordinary skill in the art to substitute the smoothing (low pass filters) of Avinash view of Gondek for the well known Gaussian filters to perform the noise reduction filtering. Furthermore, one of ordinary skill in the art would have had a reasonable expectation of success in the replacement of one type of low pass smoothing filter taught in the filtering process of Avinash in view Gondek for a Gaussian smoothing filter, as was known to one of ordinary skill in the art, with the predictable result of generating an image with reduced noise.*]

Instant claim 26: A method as in claim 4 wherein generating said noise reduced image comprises:

generating blended values in response to said counts-based modulation mask and said structure gradient mask; and [*See rejection of claim 7.*]

generating said noise reduced image in response to said blended values, smoothing of said raw data, and smoothing of said blended values. [*See rejection of claim 9.*]

Instant claims 30-31: Claims 30-31 describ the system that performs the method of claims 1-19. [*Method has been described as per rejection of instant claims 1-19. Furthermore, hardware components are described in line 18 of column 3 to line 2 of column 4 (Avinash).*]

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

- Johnson (US 2004/0131273) – variable noise reduction (median filtering) based on amount of noise.
- Frank (US 7280705) – adaptive noise filtering.

Contact Information

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan Bloom whose telephone number is 571-272-9321. The examiner can normally be reached on Monday through Friday from 8:30 am to 5:00 pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached on 571-272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Brian Q Le/

Primary Examiner, Art Unit 2624